MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016/2017

ECE3156 – SOFTWARE ENGINEERING

(EE, CE)

22 OCTOBER 2016
9:00 A.M – 11:00 A.M
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 7 printed pages only (including this page).
2. This is a closed book exam.
3. There are **FOUR (4) QUESTIONS** in this paper. **Answer ALL questions**. All questions carry equal marks (25 marks) and the distribution of the marks for each question is given.
4. Write your answers in the Answer Booklet provided.
5. State all assumptions clearly.

Question 1

Table Q1 describes the activity network information of a particular software engineering organization, for a project that they are working on.

Table Q1: Activity network information.

Activity	Description	Preceding Activity	Activity Time (days)
A	Requirements gathering	—	4
B	Project plan	A	8
C	Design plan	A	22
D	Quality Assurance plan	A, B	4
E	Test plan	B, C	8
F	Design and Test approval	B, C, D	6
G	Development	F	40
H	Testing & Rework	E, G	24

(a) By using the information in Table Q1, draw a network diagram for the listed activities using Activity on Node (AON) method.

[4 marks]

(b) Redraw the network diagram based on the information in Table Q1 using the Activity on Arrow (AOA) method.

[6 marks]

(c) With reference to part (b), compute any slack time that exists in the individual activities.

i. You need not redraw the AOA diagram. Instead, draw the necessary Earliest Start Time (EST) and Latest Finish Time (LFT) boxes on the current AOA diagram of part (b).

ii. Compute the Available Time (AT) for each activity followed with the slack time, if any.

[8 marks]

(d) With reference to part (b), identify all of the possible critical paths for this project.

[2 marks]

(e) Draw the corresponding Gantt chart for the activities of this project based on a waterfall cycle.

[4 marks]

(f) Compute the durations (in days) of this project.

[1 marks]

Continued...

Question 2

(a) List the four (4) levels of testing for conventional software. Briefly describe each of these levels.

[8 marks]

(b) Briefly explain the use of cyclometric complexity as a software testing metric.

[2 marks]

(c)

```
LN1:  float aMethod (float x, float y, float *pAns)
LN2:  {
LN3:        int result = 0;
LN4:        if (x < y && x < -1.0) {
LN5:              return -1.0;
LN6:        }
LN7:        else {
LN8:              float z = x * y + 150.75;
LN9:              float i;
LN10:             for(i = 0.0; i < z; i+=1.0) {
LN11:                   result = (result * x) / y;
LN12:                   result = pow(result, 2);
LN13:             }
LN14:             *pAns = result;
LN15:       }
LN16:       return 0;
LN17: }
```

Figure Q2: Code snippet.

Figure Q2 shows a C language code excerpt for a particular function in a program. Construct a flowgraph to illustrate the control structures in this function.

[9 marks]

(d) From part (c), calculate the cyclometric complexity of the flowgraph drawn using the node/edge calculation technique.

[2 marks]

(e) Using the value calculated in part (d), list down all the possible paths that should be tested to ensure complete control structure testing.

[2 marks]

(f) Briefly describe the difference between recovery testing and security testing

[2 marks]

Continued...

Question 3

(a) List the five (5) components of a design model.

[5 marks]

(b) A software organization is assigned to develop an Online Payment System (OPS) for an energy utility provider. A systems administrator, registered users and a maintenance developer will use this system once it is fully deployed. Description of this software system is as follows:

- The systems administrator is able to view all of the users' energy utilization records.
- Each registered user can only view his/her energy utilization record.
- The systems administrator can verify new users and remove existing users from this system.
- Each registered user can request to be added into or removed from this system.
- Each registered user is able to perform monthly bill payments.
- The system administrator is able to generate a summary of payments made by all registered users on a monthly basis.
- The maintenance developer is able to access usage logs of the OPS software for debugging purposes, if necessary.

Draw a UML use case diagram for this system. You might have to make a few assumptions about the manner, in which a user interacts with this system.

[8 marks]

(c) The following scenario is described:

Computerized Police Academy Enrolment Management System

- The police academy is currently accepting new recruits.
- The academy provides enrolment into several divisions (e.g., Patrol, Special Weapons and Detective) and advertises these division openings through the mass media.
- Interested citizens can enrol into a police academy division, and when the number of enrolments per division achieves its target, the academy contacts the recruits to confirm their enrolment. A citizen can only enrol into one academy division.
- The academy then allocates quarters to the recruits based on division and assigns division instructors to conduct preliminary assessment and training.
- Each division can have many quarters and each quarter is only assigned to one division.
- Each division can have many instructors and each instructor trains one division only.

Continued...

- After the preliminary training, recruits' performances are updated for further assessment.

The academy would like to computerize the major operations as described above.

i. List three (3) major entities of this scenario above. For each entity, specify at least one useful attribute. (***Note:*** Use a Table to list the entities and corresponding attributes.)

[3 marks]

ii. Draw the Entity-Relationship Diagram (ERD) based on the information given using the Chen model. Specify the connectivities. However, there is no need to specify the cardinalities.

[9 marks]

Continued...

Question 4

(a) State the five steps in Object-Oriented Analysis.

[5 marks]

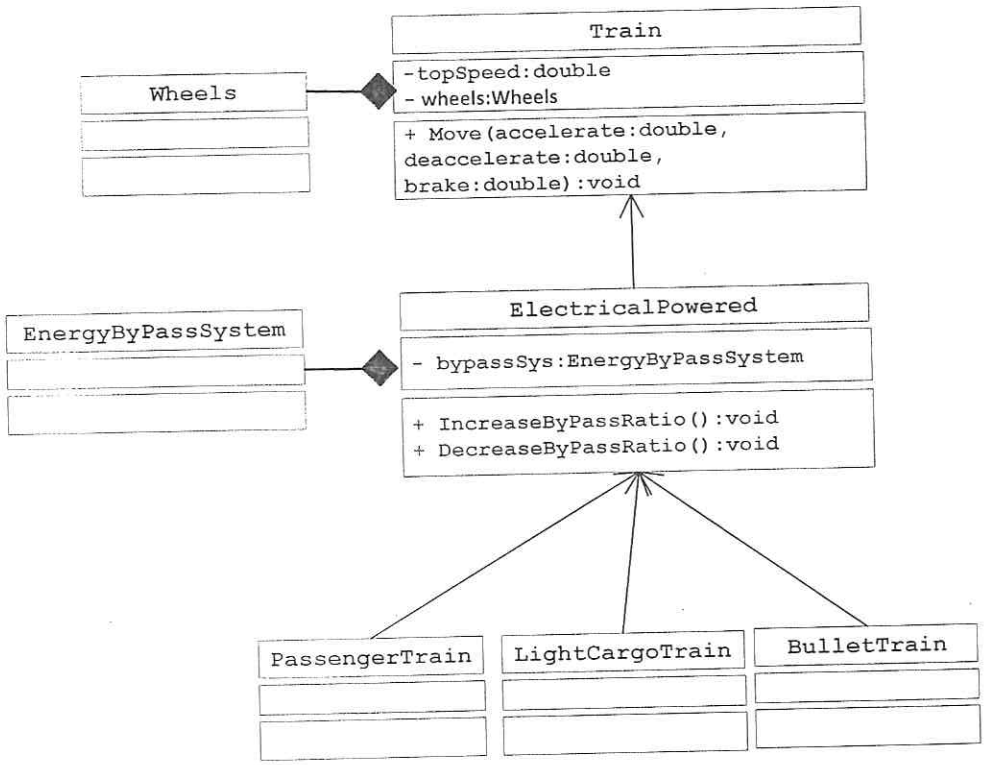

Figure Q4: UML class diagram of a train system.

(b) Figure Q4 illustrates a Unified Modelling Language (UML) class diagram of a train system.

This diagram illustrates interactions between object classes in describing a software implementation of a train system. Answer the following:

i. Determine the object classes of this system.

[4 marks]

ii. Describe the relationship between the classes in Figure Q4.

[5 marks]

Continued...

iii. A new class, **Diesel** is to be added into Figure Q4. This class is inherited from class **Train**. This class also has two new member functions, which are **IncreaseDieselInput()** and **ReduceDieselInput()**. Two other classes, which are **HeavyCargoTrain** and **MilitaryTrain** inherits from class **Diesel**.

Extend Figure Q4 to include classes **Diesel, HeavyCargoTrain** and **MilitaryTrain**, as per the abovementioned specifications. You need not redraw the entire Figure Q4. Just focus on the new classes and its relationship to the current class (or classes) in Figure Q4.

[5 marks]

(c) Consider the following temperature and humidity analysis method in a Thermohygrometer (i.e., function):

This method opens a log (i.e., text) file and reads the pre-recorded temperature (in Celsius) and humidity values (in percentage) in this file. The temperature and humidity values are stored in a row format (i.e., one row contains a pair of temperature and humidity values). There is no restriction on the number of rows in the log file.

For each row of temperature value read, the method then converts the Celsius measurement to Fahrenheit.

If the computed temperature (in Fahrenheit) falls within the range of 100 and 212 °F and if the humidity exceeds 60%, this method increases a counter (which is initialized to zero). If the counter exceeds 80, this method prints out a warning message, closes the log file and exits immediately.

Otherwise, the method continues to read the following temperature and humidity values in the log file, and repeats the temperature conversion, range and counter check until the last element of the log file is read, after which this method closes the log file and exits.

Based on the description above, draw a flow chart of this method. Apply the necessary common flowchart shapes and symbols.

Note: $T_{(°F)} = T_{(°C)} \times 9/5 + 32$

[6 marks]

End of Paper